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THE EFFECT OF GASOLINE FUMES ON DISPENSARY ATTENDANCE AND OUTPUT IN A GROUP OF WORKERS.

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The investigation here reported was made because of the complaint of a worker in a certain establishment that the gasoline used on the stamping machines in the plant was a health hazard and was injuring the worker's eyes and general health.

In all charts in this report the words "section" and "group" are interchangeable. Section Y refers to the section surveyed and the 42 workers employed therein. Twenty-two of these workers were operating or assisting on the stamping machines. Section F refers to the 53 workers in the southern half of the same room as represented in Figure 1. This group, it will be noticed, is in the same general room as the operators of the stamping machine, but the workers composing it are not so intimately associated with the machines or with the fumes from the gasoline, and they are engaged in a different form of work. Section D (or Group D), refers to the 196 workers on the floor below the one occupied by Sections (or Groups) Y and F. In Section D the same general room conditions prevail as in Sections Y and F, except as regards the gasoline fumes and the stamping machines. The work is the same as that in Section F. Section D is not shown in Figure 1, nor elsewhere; but it is located in a room of the same size as that used by Sections Y and F, is similarly situated, and has the same room conditions except as noted above and that it is on the sixth floor of the building, while Sections Y and F are on the seventh or top floor. The number of workers listed here is as of April, 1921, but it fluctuates monthly, as shown in Table I.

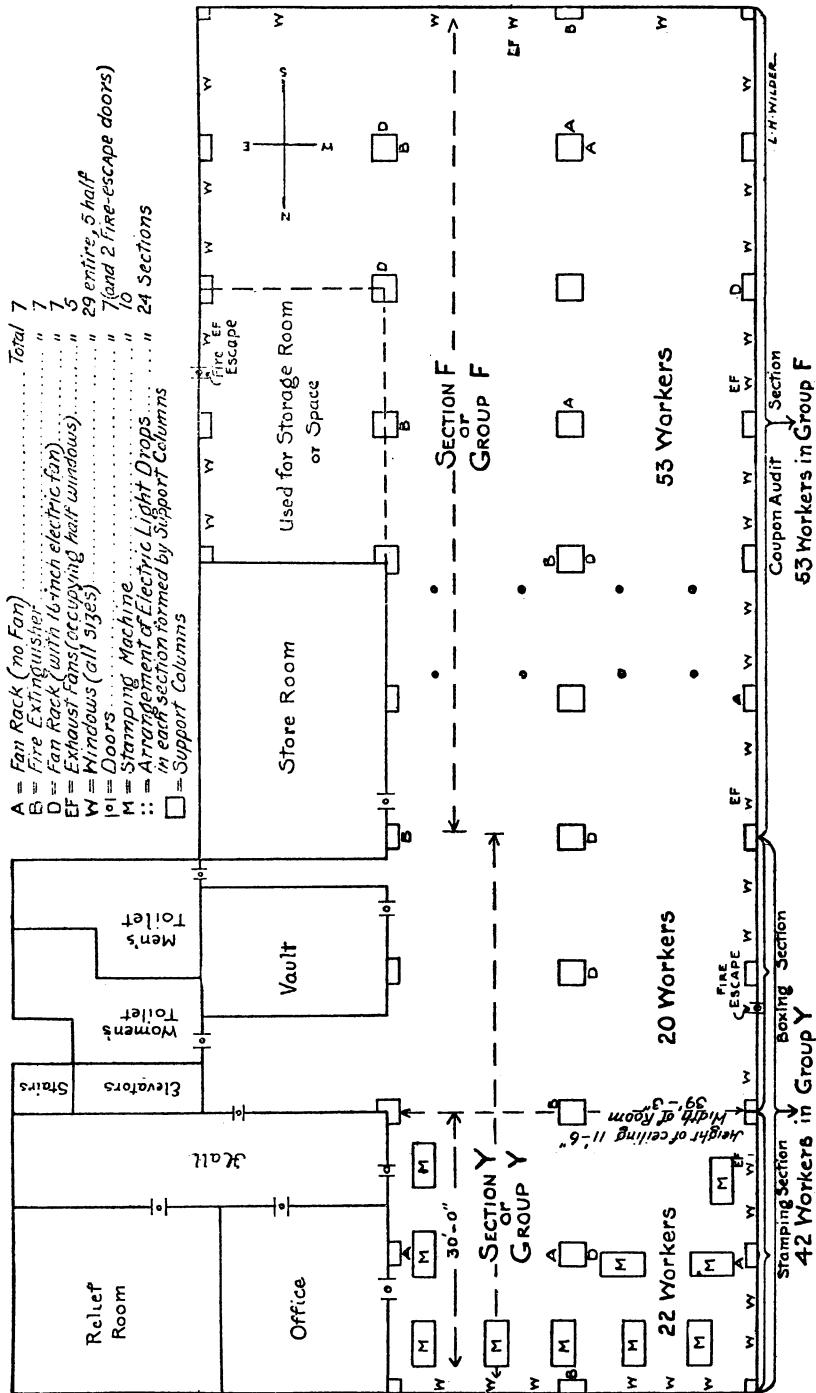


FIG 1.—Diagram of Workroom.

TABLE I.—*Number of workers in each group per month.*

Month.	Group Y ¹	Group F.	Group D.
	Boxing and stamping section.	Audit section.	Arranging section.
1920.			
August.....		63	
September.....	39	72	235
October.....	39	37	223
November.....	39	37	207
December.....	39	37	211
1921.			
January.....	39	43	211
February.....	41	55	207
March.....	41	54	200
April.....	42	53	195
May.....	42	53	226
June.....	43	57	245
July.....	43	62	230
August.....	43	67	227
September.....	43	54	216
October.....	43	46	209
November.....	43	66	200
December.....	43	77	185
1922			
January.....	41		150

¹ Including workers employed on the stamping machines.

WORKROOM CONDITIONS.

With the exception of ventilation and temperature, the sanitary conditions of the workroom were good. There was no dust hazard. Natural illumination was adequate, except with regard to the arrangement of the machines. However, these could be placed in different positions in order better to utilize natural illumination. The arrangements of the drops, the size of the globes, and the position of the desks would indicate that the artificial (electrical) illumination was satisfactory. No dust counts were made, nor were illuminometer readings taken.

TYPE OF WORKERS.

Twenty-two persons working on the stamping machines, including three males, single, three males, married, eight females, single, seven females, married, and one widow, were present and available for examination and study. The ages of the males ranged from 22 to 29 years; those of the females from 18 to 46. These 22 workers, directly exposed to gasoline fumes, received physical examinations ¹ and were closely questioned and examined in an effort to find all the factors influencing or contributing to their state of health. The workers seemed to be honest in their statements, and their complaints pertained mostly to the gasoline in use. No unusual or serious

¹ See page 2307 for the findings, symptoms, and complaints noted during the physical examination of these workers.

physical conditions were found in any of the workers during their physical examinations; consequently, all symptoms and complaints could logically be considered as resulting from a cause other than a personal impairment. Several cases of varying degrees of chronic gasoline poisoning were present in this group of 22 workers examined.

When they entered this work, all the employees were subject only to such physical and other examinations as are required for appointment in a general clerical position. Because of the nature of the work in this particular branch of the establishment, and because of several features connected with the occupation which rendered it more or less undesirable, there was occasionally a shortage of workers. For example, some of the employees objected to the noise made by the machines, to the ventilation of the workroom, to the monotony of the process, to the uncleanness necessarily connected with the process, owing to the ink and the compounds used, and to the disagreeable odor and effects resulting from the evaporation of the gasoline used in the process.

Since the compensation offered for this work is not great in comparison with the nature and the amount of labor performed, those who engage in it as a means of livelihood are, in a number of cases, individuals who do so as a last resort; though this is not true of all the workers. The process is not one that requires education or training, but depends largely on the temperament of the workers and their ability mechanically to adjust themselves to the mechanical process.

DESCRIPTION OF THE WORK PROCESS.

The process consists of the stamping of a certain type of coupon by an electrically driven machine. The stamp shows the date (the month and the year) of the cancellation of the coupons and whence they are received.

The coupons vary in size and are also of different color and design. One group, 2 by 3½ inches, and green in color, is difficult to handle, because the green ink seems to come off and clog the rubber feed belt of the stamping machine. Another group of the same size, but blue in color, requires more ink to be stamped successfully, because the blue ink of the coupon does not take up very easily the black ink used on the stamp.

These stamping machines are constructed on the same general principle. Each machine consists principally of a motor and a machine proper. The speed of the machine and of the motor can be adjusted to suit the speed of the working ability of the operator. Each machine has six revolving metal cylinders or pulleys, one feed belt, one reverse belt, one impression belt, three guides, one feed box, and one stacking-up box. The feed box and the stacking-up box are adjust-

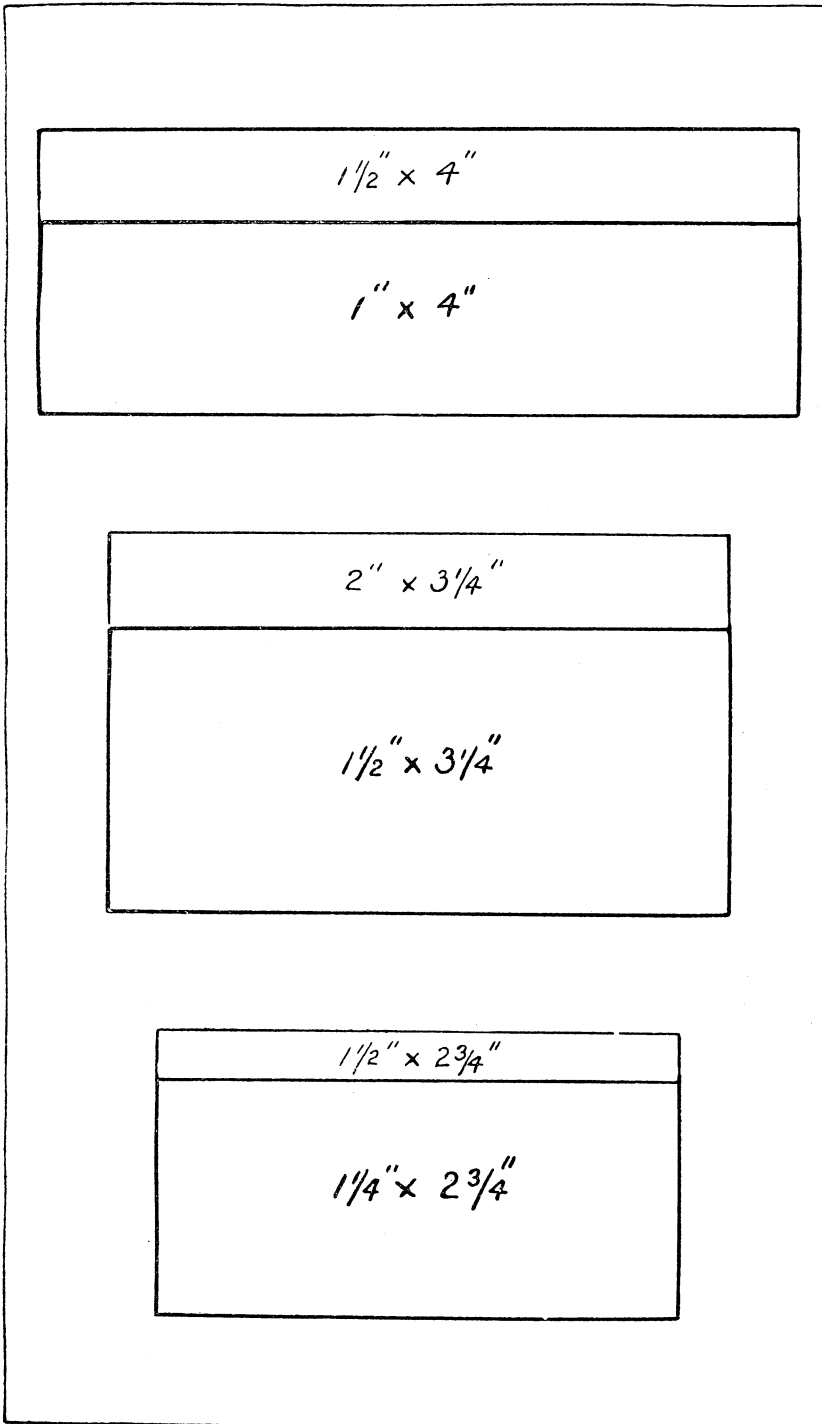


FIG. 2.—Actual sizes of coupons used in the machines.

able to the variously sized coupons. The coupons are fed into the machine at the point of contact between the rubber feed belt and the reverse belt, by the right hand of the operator and pass through the machine, which stamps, collects, and partly stacks them in the "stacking-up" place by the left hand of the operator. The operator governs the speed of the machine by a set screw, and feeds the coupons into the machine as he desires. The assistant operator, whose duty it is to find all unstamped coupons and to look after damaged or torn coupons, inspects and completes the stacking up of the coupons after they have passed through the machine. In some cases the operators and assistant operators alternate in this work, but as a rule they do not.

FACTORS INFLUENCING THE OUTPUT.

The number of coupons stamped in a given time is governed by the size and shape of the coupons, the color or nature of the ink used on them, and by their condition. If the coupons are soft, worn, or torn, more time is required to stamp them than if they are in good condition or are fairly stiff. The frequent changing, in the die of the stamping machine, of the date and the number of the establishment from which the coupons were received, causes a loss of time. Handling small lots of varying sizes of coupons causes loss of time, owing to the making of necessary records and to changing the die. It often happens that one or more of these retarding conditions arise in a day or during a week, with one or more workers or with the entire group of workers and hence, their daily and weekly averages will be lowered. The light weight of the paper coupons will not permit of drafts or air currents from electric fans or raised windows; hence the room conditions in hot or humid weather probably affect the production to a certain extent. The output depends, to a limited extent, on the team work; therefore a slow system and a slow operator retard the output.

Table II shows for one year the average daily output, by weeks, for each stamping machine, and the number of operators and assistants in the boxing and stamping section employed on these machines.

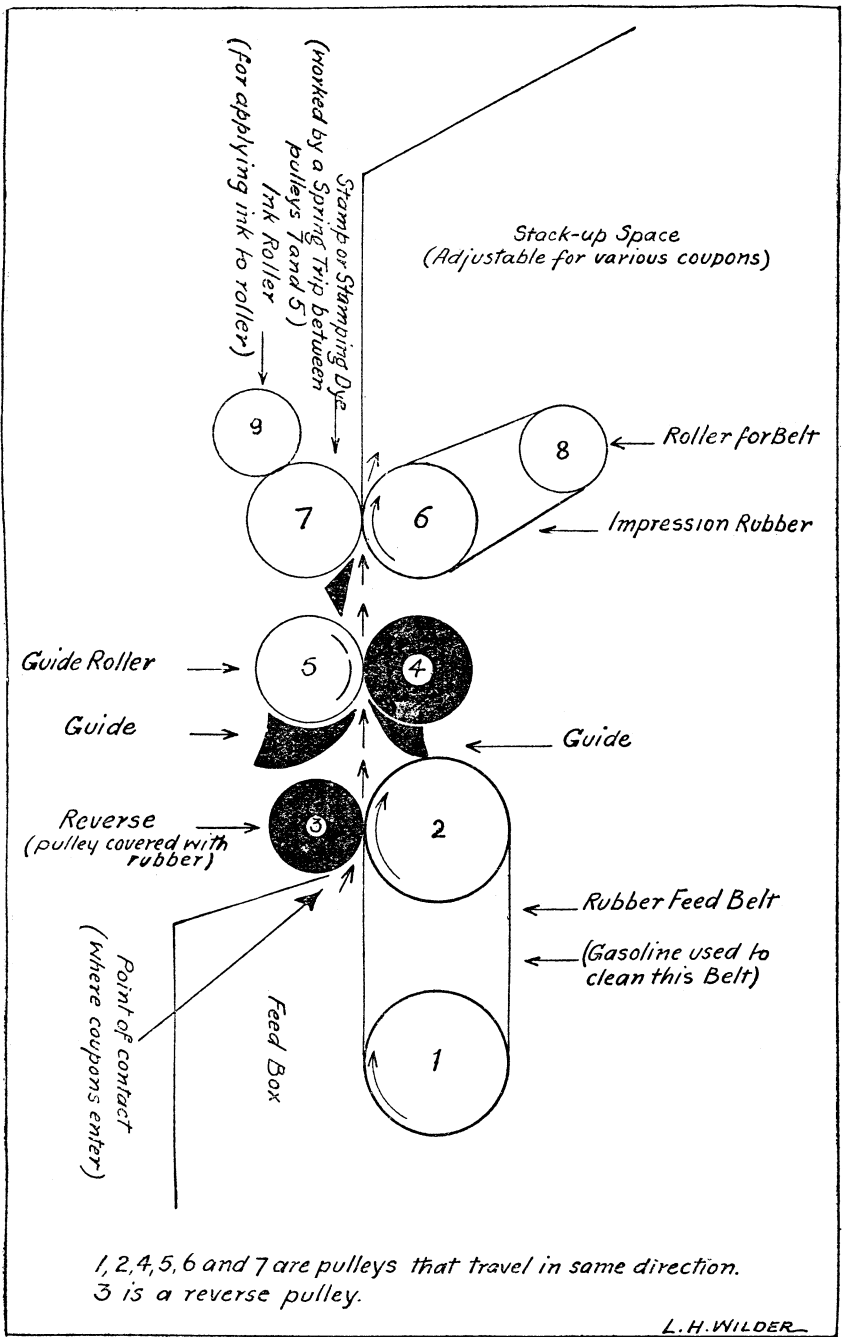


FIG. 3.—Stamping machine.

TABLE II.—Average daily output, by weeks, and number of workers.

Week ending—	Average daily output.	Number of operators and assistants.	Week ending—	Average daily output.	Number of operators and assistants.
1921.			1921.		
Jan. 29.....	50,362	21	July 30.....	59,520	24
Feb. 5.....	49,721	23	Aug. 6.....	54,988	31
Feb. 12.....	49,483	21	Aug. 13.....	51,223	34
Feb. 19.....	54,825	24	Aug. 20.....	47,585	35
Feb. 26.....	60,070	24	Aug. 27.....	48,143	32
Mar. 5.....	45,959	27	Sept. 3.....	50,696	32
Mar. 12.....	58,868	23	Sept. 10.....	48,281	35
Mar. 19.....	46,772	28	Sept. 17.....	53,427	32
Mar. 26.....	47,260	26	Sept. 24.....	58,771	30
Apr. 2.....	41,839	25	Oct. 1.....	62,593	25
Apr. 9.....	64,730	28	Oct. 8.....	54,681	24
Apr. 16.....	68,137	26	Oct. 15.....	57,385	27
Apr. 23.....	53,813	19	Oct. 22.....	60,069	27
Apr. 30.....	67,456	25	Oct. 29.....	65,196	24
May 7.....	60,503	23	Nov. 5.....	61,150	27
May 14.....	57,495	26	Nov. 12.....	58,361	27
May 21.....	57,229	30	Nov. 19.....	55,947	26
May 28.....	46,724	32	Nov. 26.....	48,171	26
June 4.....	48,936	29	Dec. 3.....	46,680	24
June 11.....	49,240	30	Dec. 10.....	62,337	26
June 18.....	45,716	28	Dec. 17.....	69,359	26
June 25.....	42,920	24	Dec. 24.....	50,832	27
July 2.....	50,749	30	Dec. 31.....	25,455	29
July 9.....	58,973	30			
July 16.....	63,504	29	1922.		
July 23.....	54,141	30	Jan. 7.....	62,718	21

As production records were available for only one year, and as the survey was made during the beginning of the fourth month of the year, a comparison of the periods before and after the survey, in so far as the production is concerned, does not afford evidence as conclusive as might be desired, but detailed study, as described in this paper, makes such comparison valuable.

FATIGUE.

A certain degree of fatigue beyond the normal physiological amount is possibly produced by the monotony of the occupation and by the speeding up induced by the desire to increase output and thereby gain favor and an increase in salary. A certain average must be maintained. This average is established by the best operators, and it is also accepted as the standard for persons of a less active nature, who are thus required to exert themselves. Faulty posture, steady work, eyestrain, monotony, loud noises, prolonged pressure of the body against the desk or the table, are all factors that tend to produce fatigue.

HEALTH HAZARDS, LENGTH OF THE WORK DAY, AND AMOUNT OF EXPOSURE.

In cleaning the rubber feed belt on pulleys 1 and 2 of the stamping machine (see Fig. III) with gasoline or a compound of gasoline and oil of wintergreen, fumes are produced and liberated in the workroom as

a result of evaporation. This cleaning of the feed belt is necessary, as the belt becomes coated with the ink and dirt from the coupons as well as with the grease and ink from the ink pad of the stamping machines. After the feed belt becomes thus coated with grease and ink it will not properly pick up the coupons and feed them into the machine. For many months previous to this investigation, the workers had used gasoline to remove the ink and grease from the feed belt. The gasoline quickly removes the ink and grease which clog the pores of the rubber and, because of rapid evaporation, does not retard the speed of the operator, but increases speed in production by increasing the roughness of the feed belt so that the coupons may be fed into the machine more rapidly. This led to a more frequent use of gasoline than was necessary. The gasoline was kept in open containers within 20 inches of the face of the workers and was applied frequently to the rubber feed belt with a piece of cloth. This resulted in constant emanation of the fumes into the atmosphere. These fumes were found to be responsible for the complaints made by the workers.

It was stated by the workers that for the four months previous to the making of the investigation a much cheaper and lower grade of gasoline than that customarily used had been supplied and that the fumes from this gasoline had been extremely irritating and disagreeable. Ten gallons of gasoline a month was the average consumption for 10 stamping machines. The cubic content of the northern section of the workroom (see Fig. 1) in which these machines were installed was 13,541 cubic feet,¹ including space occupied. Twenty-four workers normally occupied this section, giving approximately 564 cubic feet to a worker. Reducing the 10 gallons of gasoline to minims and considering twenty-four² 7-hour days to the working month, with 24³ workers exposed, it is estimated that each individual working on these machines was exposed to the liberation of 152.4 minims an hour. It has been determined by physiological tests that the average person inhales approximately 19.06 cubic feet of air an hour, or approximately 135 cubic feet in a 7-hour work day.⁴

It was found that 36.5 minims of gasoline was the maximum amount possible to be inhaled by each individual in one hour, or 255.4 minims in a 7-hour workday, 24 days to the month. However, this amount may or may not have been inhaled by each workman, because the amount inhaled was subject to variation according to the air currents and to the

¹ The space in question was not a separate room containing the air space represented by these figures, but was only the northern part of the large workroom as shown by heavy arrows in Fig. 1.

² Because of Sundays, legal holidays, and half days on Saturdays during the summer months, 24 working days are considered a fair estimate of the exposure.

³ The relief workers and machine repairers are included with the 20 workers on the 10 machines, since they are constantly near or working on the machines.

⁴ On the basis that the amount of tidal air inhaled at each inspiration is 30.5 cu. in., or 500 c. c., and allowing 18 respirations a minute.

position of the worker in the room. The cloths used for cleaning the belt and the vessels containing gasoline were within 20 inches of the workers, and the air movement and ventilation of the workrooms were seldom satisfactory, because the extreme lightness of the coupons did not permit of the use of electric fans, or of air currents in any form, directly upon or around the machine. The method of computing the amount of gasoline inhaled seems admissible and reasonable. The computation is merely a mathematical one. No laboratory tests were made to ascertain the concentration or the percentage of various gases in the room atmosphere because the actual use of gasoline was discontinued, by order of the officials in charge, at noon of the day previous to the day of investigation. This was a matter of regret, for the investigators were in the workroom while gasoline was in use and the fumes were very noticeable. These fumes were also noticed in the hallways and the elevator shafts.

HOW DISPENSARY ATTENDANCE WAS COMPUTED.

The dispensary attendance as given in this report is the annual admission rate per employee and was computed as follows:

Each visit of an individual from a respective section was listed, and at the end of the month the total number of visits to the dispensary was divided by the total number of workers in that section for the month. This gives the actual number of visits per employee during the month. The number of visits which would occur in a year was then obtained by dividing the number of days in the year by the number of days in the month in question and by multiplying the quotient by the monthly rate. Thus the dispensary attendance rate used in this paper is the number of admissions which would occur per employee per year if the rate for the month in question should be maintained.

Data on only those conditions of the eyes, head, nose, and throat, or respiratory system, etc., most likely to be affected by the gasoline fumes were taken from the dispensary record and used in computing the admission rate. These records were carefully collected by a registered nurse, under supervision, and the same class of cases was considered over the entire period studied. Physical examination was made of all workers exposed, and every complaint and symptom was listed.

It was, of course, recognized that there are many diseases or conditions that would affect the eyes, head, nose, and throat; therefore the same types of complaints were studied in the other departments where gasoline fumes were not present.

Table III shows, by months, the number of workers employed in each section, the number of visits to the dispensary from each section, and the annual admission rate per employee for each section.

TABLE III.—Annual admission rate per employee, by sections.

Month.	Number of workers.			Number of dispensary visits.			Annual admission rate per employee.		
	Section Y.	Section F.	Section D.	Section Y.	Section F.	Section D.	Section Y.	Section F.	Section D.
1920.									
August.....	—	63	—	—	27	—	—	4.95	—
September.....	39	72	235	21	20	27	6.45	3.41	1.34
October.....	39	37	223	17	20	26	4.83	6.36	1.30
November.....	39	37	207	21	12	25	6.45	3.89	1.46
December.....	39	37	211	11	12	25	3.30	3.77	1.41
1921.									
January.....	39	43	211	9	11	31	2.71	2.94	1.65
February.....	41	55	207	41	20	15	13.04	4.69	.91
March.....	41	54	200	23	26	11	6.59	5.65	.65
April.....	42	53	196	21	15	15	6.08	3.41	.97
May.....	42	53	226	6	11	25	1.65	2.47	1.30
June.....	43	57	245	13	15	13	3.65	3.16	.61
July.....	43	62	230	7	9	25	1.88	1.65	1.30
August.....	43	67	227	10	13	19	2.71	2.24	.94
September.....	43	54	216	7	12	20	1.95	2.68	1.10
October.....	43	46	209	16	14	51	4.36	3.53	2.83
November.....	43	66	200	16	17	24	4.50	3.29	1.46
December.....	43	77	185	9	13	28	2.47	1.88	1.77

¹ Use of gasoline discontinued. Poor grade had been in use since January. Many experiments to find a suitable substitute for gasoline were made during part of April.

THE DISPENSARY ATTENDANCE BEFORE THE SURVEY.

Figure IV gives the dispensary attendance for Groups Y, F, and D from August, 1920, to December 31, 1921. Records prior to August, 1920, were not available. One of the purposes of this graph is to show the effect, if any, of the poor grade of gasoline said to have been in use since about January 1, 1921, on the rate of dispensary attendance of the exposed group, as compared with a control or nonexposed group of workers, other conditions being identical.

It will be seen that the average annual admission rate per employee of dispensary attendance of the workers for the time here recorded while gasoline was in use, August, 1920, to March, 1921, inclusive, was as follows: Over six visits in Group Y, the exposed group; over four visits in Group F, the adjoining group; and only one visit in Group D, the control or nonexposed group on the floor below.

It is therefore evident that the gasoline fumes, together with the complicating factors of the workroom processes, produced this situation.

SELECTION OF SUBSTITUTE FOR GASOLINE.

The perpendicular lines shown in center of Figure IV represent the date of the survey and the week in which the experiments, as described below, were carried out in an effort to find a suitable substitute for gasoline.

When it had been definitely decided that gasoline was the principal health hazard in Section Y, and when the exact manner of use of the

gasoline had been ascertained, the investigators immediately began to look for substitutes that would render the same service without producing harmful and obnoxious fumes or injuring the health of the workers.¹ The first three or four days were spent in studying the efficiency of the following compounds: (1) 95 per cent alcohol, (2) ethyl acetate, and (3) carbon tetrachloride. Observations were made as to the rapidity with which these compounds removed the ink and the grease from the belts, as to the odors produced, and as to approval or objection on the part of the workers. Of the three substitutes, the operators selected the 95 per cent alcohol as the most efficient and as having the most pleasant odor. There were objec-

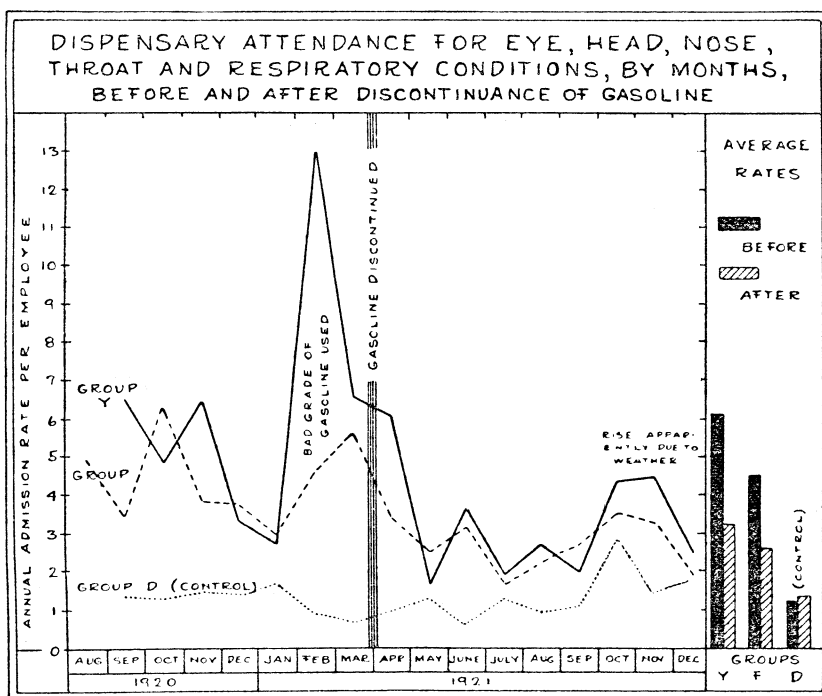


FIG. 4.—Dispensary attendance before and after discontinuance of gasoline.

tions to the use of alcohol, however, in that some of the workmen would be inclined to carry the alcohol home for medicinal or other purposes, and in the matter of expense, alcohol being 80 cents a gallon as compared with 27 cents a gallon for gasoline. Kerosene oil was next tested. As the workers objected to the odor of the kerosene, it was disguised by the addition of an essential oil. After allowing the workers to use the kerosene for three or four days, they were again furnished with the 95 per cent alcohol solution treated with a

¹ Assistant Chemist H. W. Houghton made experiments with various compounds and finally selected the one most suitable for the process.

small amount of phenolphthalein and caustic soda. After the workers had used this alcohol for several days, it was observed that they complained of headache and dizziness. Statements were also made that the alcohol was not as satisfactory as the kerosene, for the gauze used to clean the belts, when moistened with the alcohol, dried out much more quickly than when kerosene was used. In using the kerosene it was not necessary to moisten the gauze before each application. Time was thereby saved by the operator. The use of the alcohol was discontinued.

Efforts were then directed toward disguising the kerosene, in order to overcome the objection of some of the workers to its use. At first the kerosene was colored with Sudan-3 and was perfumed with birch oil. But this combination produced an odor which was unpleasant to the workers. Kerosene colored with alkanet and perfumed with anise oil and vanillin was then tried. This mixture made the room very odorous and could not be used. After this experiment, kerosene colored with alkanet and perfumed with oil of lavender flowers was tried. This mixture was also objectionable because of the odor. Finally, kerosene colored with alkanet and perfumed with a slight amount of anise oil was tried, and proved satisfactory. It was decided that kerosene colored with alkanet and perfumed with 1 ounce of anise oil to 10 gallons would be a good substitute to use in the place of gasoline. The total cost of this preparation should be less than \$2 per 10 gallons.

RESULTS OF THE STUDY AND RECOMMENDATIONS.

The use of gasoline was discontinued, and kerosene, colored with alkanet, plus 1 ounce of anise oil as a deodorant to every 10 gallons of kerosene, was substituted. The results following the adoption and use of kerosene in place of gasoline, as previously described, will be discussed in the next paragraph and are shown in Figure IV.

It will be noticed in Figure IV that immediately following the discontinuance of the use of gasoline, and the period of experimentation leading to the selection of a suitable substitute, there was a decided drop in the rate of dispensary attendance in Groups Y and F.

Comparison of the annual admission rate per employee of dispensary attendance for a period of eight months before the survey and the adoption of a substitute for gasoline, with the period of nine months after the substitution of kerosene, shows that the rate of dispensary attendance dropped approximately 48 per cent in Group Y, and approximately 42 per cent in Group F, whereas in the control group, Group D, there was a slight rise, which is accounted for. The rise in the rate of dispensary attendance in Groups Y, F, and D during the month of October, as shown in Figure IV, is attributed to a common cause, the weather conditions which existed in the city at

that time, since this rise in dispensary attendance was similar in all groups. This increase in dispensary attendance was checked with dispensary records in several other dispensaries in the same city, all of which show an increase in conditions attributable to coryza, affection of the tonsils, and inflammation of the throat, or, as commonly called, "bad colds" and light attacks of "la grippe."

The difference between the rate of dispensary attendance in Groups Y and F, as compared with Group D, after gasoline was discontinued, as shown in Figure IV, can be explained, to a certain extent, by the noises from the machines; by a certain amount of odor from the ink, the oil, and the grease used on the machines; by a lack of ventilation in the workroom; and by a habit of visiting the dispensary, acquired previous to this investigation. If certain improvements in the room conditions, and other suggestions embodied in recommendations submitted immediately after the survey, had been carried out, the annual admission rate of Groups Y and F would probably have been near that of Group D.

THE RELATION OF PRODUCTION TO DISPENSARY ATTENDANCE.

The daily average of production by weeks is computed by tabulating from day to day the output of each operator or assistant operator working on a machine, the record being the number of coupons stamped by each machine, and, at the end of the week, totaling the number of coupons stamped by each machine and dividing the total by the number of work days. This is the daily average for the week for each machine. The weekly averages for each of the 10 machines are then added and divided by 10, which gives what is known as the average daily output for that week (see Table II). The 10 machines are in almost constant operation, and when the statement is made that the average production for a certain week represented, let us say, 30,000, we mean that this is the average for each of the 10 machines per day for that week, the total output per day by the 10 machines being considered as 300,000 coupons, which was the lowest weekly day-average for any week.

It is by these records that the management is able to keep check on the production of the operators and their assistants and thereby make promotions and increase compensations.

After having tabulated the data which show such a reduction in the rate of dispensary attendance following the discontinuance of the use of gasoline, it was decided to ascertain the effect of the removal of gasoline fumes on the production of the workers.

It will be noted in Table II that the production promptly made a remarkable gain for the 10 stamping machines, increasing from a weekly average of about 47,200 coupons during the week of March

26, 1921, to a weekly average of about 68,000 coupons during the week ending April 16. This is an increase of about 44 per cent in the production. However, this remarkable increase was not maintained and it may have been largely psychological, or at least partly so. The average increase of 9 per cent for the entire 8-month period, including the great depression in June and the slight depression about the last of August, would probably be nearer the correct figure. The drop in output from about May 21, 1921, until July 2, 1921, can be partly accounted for by the fact that at this time the majority of the skilled workers with a number of their skilled assistants were on annual leave, and in their places were individuals temporarily transferred from their usual work to the stamping machines. Also, about the middle of June and again in August, a cheap grade of kerosene was supplied to the workers. This kerosene caused a great deal of dissatisfaction and complaint among the workers, as it produced fumes which resulted in headaches and other complaints and produced a dermatitis upon the fingers of the workers. A sample of the oil obtained at that time was found to contain about 25 per cent of a heavy paraffin oil and to give a positive test for sulphuric acid. The conditions described above arose whenever the kerosene was not of high grade. If kerosene is not pure and contains any adulterant of sulphuric acid, as it did in this case, it can not be colorized with alkanet, as the sulphuric acid prevents its colorization. It will be noted that during the periods of the two drops or depressions (see Table II), there was a rise in the dispensary attendance (see Figure IV). It is believed that the impure kerosene influenced both the production and dispensary attendance.

The production from week to week in Group Y, of course, varies (see Table II); but this variation can be accounted for in almost every case by the factors previously enumerated in the section headed "Factors Influencing the Output." Variation in production was necessarily investigated, and it was found that the best operators would occasionally vary as much as 50 per cent per day in their output. This produced a marked weekly variation in the production.

It can then reasonably be stated that the substitution of pure kerosene, colored with alkanet and deodorized with anise oil, for gasoline of a more or less impure nature in the work carried on in Group Y resulted in a decrease in the annual admission rate per employee of dispensary attendance from a maximum in February of 13 visits per annum, or from an average rate of over 6 visits per annum over an 8-month period, to a constant average of a little over 3 visits per annum in the 9-month period following the adoption of the use of kerosene. The production increased from an average of 50,834 coupons for the short period before the survey to an average of 55,402 for the 8 months following the survey, an increase during the 8-month period of 9 per cent.

SYMPTOMS PRODUCED BY GASOLINE FUMES.

The symptoms, as given by Kober and Hanson,¹ Oliver,² Ram-bousek,³ Thompson,⁴ and Alice Hamilton,⁵ produced by low-boiling distillates of petroleum—gasoline, naphtha, and benzine—that would likely be found in individuals who are at work and suffering from what is called mild chronic cases of gasoline poisoning, are—

- | | |
|------------------------------|--|
| 1. Dizziness. | 12. Vomiting. |
| 2. Irritation of the throat. | 13. Stupidity and listlessness. |
| 3. Cough. | 14. Loss of strength. |
| 4. Headache. | 15. Insomnia. |
| 5. Vertigo. | 16. Loss of weight. |
| 6. Drowsiness. | 17. Paleness, or loss of color. |
| 7. Loss of appetite. | 18. Aching eyes. |
| 8. Distaste for food. | 19. Conjunctivitis. |
| 9. Constipation. | 20. Muscular twitching and impairment. |
| 10. Pain in the stomach. | 21. Exhaustion. |
| 11. Nausea. | |

Petroleum distillates, however, produce an acute condition, the symptoms of which are usually given as "headache, nausea, stupid feeling, heaviness or sleepiness, roaring in the ears, inclination to cough, feeling of irritation and constriction in the throat, trembling of the hands and arms, sensation of crawling over the skin, excitement or irritability. Girls are said to grow talkative and foolish and laugh a great deal; men are said to be unreasonable and easily provoked to anger. These symptoms may be felt most intensely during the first hours of the day, but in other cases they come on when the person leaves work and goes out into the open air."⁶ The workpeople call an acute attack of such poisoning a "jag."

The acute cases, as here described, seldom occur; but at times they do occur, with the patient passing on to a comatose condition, with cold skin, pale and pulseless, and sometimes resulting in death.

The chronic form is a continuation of the conditions listed above, which sometimes go to the extent of extensive impairment of the health of the individual, owing to changes in the nerve or muscular systems and sometimes alteration of the blood.

RESULTS OF PHYSICAL EXAMINATIONS.

In making the physical examinations of the 22 employees working directly on the stamping machines, the following symptoms were found:

Diseases of Occupation and Vocational Hygiene (1916), p. 137.

Diseases of Occupation, p. 83.

Industrial Poisoning, p. 61.

Diseases of Occupation, p. 333.

Industrial Poisons used in the Rubber Industry. Bulletin No. 179, U. S. Department of Labor, p. 22.

Idem, pp. 22, 23

Symptoms.	Male.	Female.	Symptoms.	Male.	Female.
Headache.....	4	9	Insomnia.....	0	2
Daily headache.....	4	4	Tingling or crawling sensation		
Varying headaches.....	0	5	of the skin of left arm and		
Drowsiness.....	3	8	fingers.....	0	1
Afternoon drowsiness.....	2	3	Tingling or crawling sensation		
Dizziness.....	3	5	of skin on right hand and fore-		
Heaviness in head.....	1	8	arm.....	0	1
Dull aching pain in eyes.....	2	6	Complaint of extreme muscular		
Irritated eyes (burning, smart-			weakness.....	0	4
ing, or gritty feeling).....	2	10	Extreme tiredness in the morn-		
Excessive lachrymation (wa-			ing.....	3	0
tery eyes).....	1	10	Complaint of gradual loss of use		
Blurred vision.....	0	3	of left forearm, wrist, and		
Puffed eyelids.....	0	1	hand.....	0	1
Slight conjunctivitis, one eye.....	1	1	Exhaustion or "all-in" condi-		
Slight conjunctivitis, both eyes.....	1	2	tion by mid-afternoon.....	0	4
Impaired taste.....	0	1	Overtiredness at quitting time.....	0	8
Continued hoarseness.....	0	1	Occasional attack of colic.....	0	2
Sore and inflamed throat.....	0	4	Nausea (in two cases occurred		
Constant irritation of throat			daily, other cases at various		
(tickling or itching).....	0	2	times).....	2	3
Constant dryness of throat.....	0	4	Loss of appetite.....	1	6
Extreme nervousness.....	0	3	Constipation.....	0	4
Feeling of worry.....	0	3	Loss of weight.....	0	1
Easily angered.....	0	5	Frequent urination, condition		
Often easily excited.....	0	5	lasting from a few days to		
Complaint of the work being			four months.....	2	4
nerve racking.....	2	2			

¹ Lack of sleep no doubt the cause.

CONCLUSIONS.

1. The gasoline fumes liberated in the workroom studied had produced cases of mild chronic gasoline poisoning.

2. In workrooms where the ventilation is not adequate, the liberation of gasoline fumes from open containers or from processes will, sooner or later, depending upon the amount and the concentration of the fumes, produce cases of acute, mild chronic, or chronic gasoline poisoning.

3. The liberation of gasoline fumes above an undetermined concentration, in an improperly ventilated workroom, will result in increased dispensary attendance and absenteeism among the workers exposed.

4. Increased production and a lower rate of dispensary attendance were obtained by the removal of the gasoline fumes.

VENEREAL DISEASE SOCIAL SERVICE IN PLAINFIELD, N. J.

By A. J. CASSELMAN, Acting Assistant Surgeon, United States Public Health Service, Consultant, Bureau of Venereal Disease Control, New Jersey State Department of Health.

The New Jersey law places upon the local boards of health in the State the duty of investigating cases of venereal disease and of ascertaining all sources of infection and all exposures. It is believed that the steps which led the Board of Health of Plainfield, N. J., to undertake this duty placed upon it by law and to appoint a venereal-disease social worker, and the methods which this worker employs